

FATTY-ACID COMPOSITION OF AQUEOUS EXTRACTS OF MUMIYO AND ROOTS OF *Rhodiola Semenovii*

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UDC 547.915;615.322.616

Rhodiola Semenovii (Rgl. et Herd.) Boriss. (Semenov rhodiola) (Crassulaceae) is used in folk medicine for gastrointestinal diseases and tuberculosis. However, its chemical composition is little studied [1].

Mumiyo is a natural product and is also used in medicinal preparations [2].

The goal of our work was to isolate and study the composition of fatty acids in aqueous extracts of *Rhodiola* roots, mumiyo, and a substance prepared from them. Aqueous extracts were obtained by boiling *Rhodiola* roots and mumiyo [3]. The fatty-acid composition of the aqueous extract of *Rhodiola* roots has not been reported.

Lipids from the air-dried extracts were extracted three times by $\text{CHCl}_3:\text{CH}_3\text{OH}$ (2:1), stirring each time on a magnetic stirrer for 1 h. Then, lipid extracts were combined and washed of nonlipid components using aqueous CaCl_2 (0.04%). The CHCl_3 was removed. The total lipids were hydrolyzed by KOH in CH_3OH (10%) with refluxing on a boiling water bath. The reaction mixture was cooled and treated with distilled water (10-15 mL) and H_2SO_4 solution (10%) until the reaction mixture was acidic. The released fatty acids were extracted three times with diethylether. The ether was distilled off. The fatty acids were converted to the methyl esters using diazomethane [4].

The total fatty-acid methyl esters were purified of ballast substances by TLC on silica gel using hexane:ether (8:2).

The methyl-ester band (R_f 0.85) was collected and eluted from the silica gel using CHCl_3 . The solvent was removed. The yields of methyl esters from the studied specimens were as follows (mass %): extract of *R. Semenovii* root, 0.55; mumiyo, 0.75; substance, 0.72.

Next the methyl esters were dissolved in hexane (0.1 mL) and chromatographed in a Chrom-5 instrument with a flame-ionization detector using a steel column (2.5 m) of internal diameter 4 mm packed with Reoplex 400 (15%) on Inerton N-AW at 194°C and vaporizer temperature 260°C. The carrier gas was N_2 and H_2 at 30 mL/min.

Table 1 lists the fatty-acid composition of the substance and its components.

TABLE 1. Fatty-Acid Composition of Extracts, mass %

Acid	<i>Rhodiola</i>	Mumiyo	Substance
Caprylic (8:0)	0.3	1.0	1.0
Caprinic (10:0)	0.2	1.5	0.9
Lauric (12:0)	0.6	1.3	3.9
Tridecanoic (13:0)	0.3	5.4	0.3
Myristic (14:0)	7.9	4.1	5.2
Pentadecanoic (15:0)	2.8	2.6	1.2
Palmitic (16:0)	40.1	30.7	30.6
Palmitoleic (16:1)	1.5	1.3	2.4
Margaric (17:0)	1.5	1.0	2.1
Steric (18:0)	13.9	14.2	20.6
Oleic (18:1)	16.4	15.8	18.9
Linoleic (18:2)	12.9	18.8	11.2
Linolenic (18:3)	1.1	-	1.1
Arachic (20:0)	0.5	2.3	0.6
$\Sigma_{\text{sat.}}$	68.1	64.1	66.4
$\Sigma_{\text{unsat.}}$	31.9	35.9	33.6

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Table 1 shows that both the preparation and the extracts of *Rhodiola* root and mumiyo contained up to 14 fatty-acid components. The total saturated acids was >60% in all studied specimens, 50% of the mass of which was 16:0 acid. A significant fraction was the 18:0 and 14:0 acids. The unsaturated acids were represented mainly by the 18:1 and 18:2 acids.

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